19/MHS01/351

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1 $y - 3x - 2 = 0$

$3y + x + 9 = 0$

Solution

$y - 3x - 2 = 0$

$y = 3x + 2$

$y = mx + c$

$m_1 = 3$

$3y + x + 9 = 0$

$3y = -x - 9$

$y = \frac{-x}{3} - \frac{9}{3}$

$y = -\frac{1}{3}x - 3$

$y = mx + c$

$m_2 = -1/3$

$m_1 m_2 = -1$

$3 \times -1/3 = -1$

$-1 = -1$

∴ The two equation are perpendicular

2 $3y - 4 = 2x + 3$

$y - 5 = x + 6$

Solution

$3y - 4 = 2x + 3$

$3y = 2x + 7$

$y = \frac{2x}{3} + \frac{7}{3}$

$y = mx + c$

$m_1 = 2/3$

$y - 5 = x + 6$

$y - 5 = x + 6$

$y = x + 11$

$y = mx + c$

$m_2 = 1$

$m_1 \cdot m_2 = -1$

$\frac{2}{3} \times 1 \neq -1$

∴ The two equations are not perpendicular.

3 $x^2 + y^2 + 3xy - 11 = 0$

$2x + 2y\frac{dy}{dx} + 3\left(x\frac{dy}{dx} + y\right) = 0$

$2x + 2y\frac{dy}{dx} + 3x\frac{dy}{dx} + 3y = 0$

$2y\frac{dy}{dx} + 3x\frac{dy}{dx} = -2x - 3y$

$$\frac{dy}{dx}(2y+3x) = -2x - 3y$$

$$\frac{dy}{dx} = \frac{-2x-3y}{(2y+3x)}$$

$$\frac{dy}{dx} = \frac{-2x-3y}{(2y+3x)}$$

$$m = \left.\frac{dy}{dx}\right|_{x=1,\,y=2} = \frac{-2(1)-3(2)}{2(2)+3(1)} = \frac{-8}{7}$$

$$m_1 = -\frac{8}{7}$$

Equation of tangent

$$y - y_1 = m(x - x_1)$$

$$y - 2 = -\frac{8}{7}(x-1)$$

$$7(y-2) = -8(x-1)$$

$$7y - 14 = -8x + 8$$

$$7y + 8x - 14 - 8 = 0$$

$$7y + 8x - 22 = 0$$

$$m_1 m_2 = -1$$

$$m_2 = \frac{-1}{m_1} = \frac{-1}{-8/7} = \frac{7}{8}$$

$$y - 2 = \frac{7}{8}(x-1)$$

$$8(y-2) = 7(x-1)$$

$$8y - 16 = 7x - 7$$

$$8y - 16 = 7x - 7$$

$$8y + 7x - 16 + 7 = 0$$

$$8y - 7x - 9 = 0$$